

4

Technological Hazards: Applying the Four Phases

In this unit, you will learn

- Definitions of major technological hazards.
- Signs and warnings of each technological hazard.
- Immediate and long-term dangers posed by each technological hazard.
- Mitigation, preparedness, response, and recovery measures that are appropriate for each technological hazard, and
- Related emergencies that can follow in the event of an emergency involving a technological hazard.

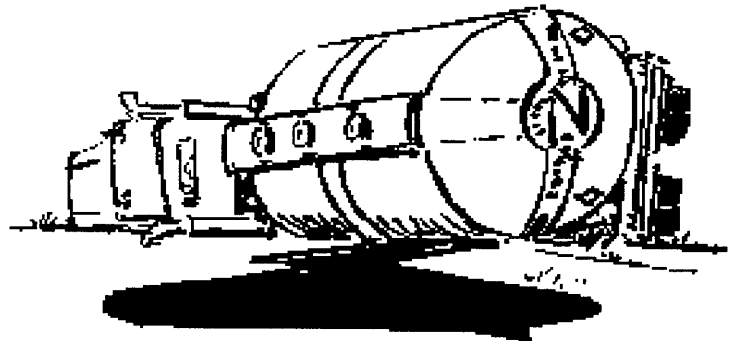
GENERAL MEASURES

Technology is the product of our attempt to manipulate our environment through application of scientific principles that have proved useful for adapting the world to meet our needs and objectives. Technological or man-made threats represent a category of events that have expanded dramatically throughout this century along with advances in modern technology. Emergencies involving technological hazards include hazardous materials incidents at fixed facilities, hazardous materials incidents resulting from transportation accidents, radiological incidents at fixed facilities, radiological incidents resulting from transportation accidents, structural fires, and power or communications outages.

Like natural threats, technological hazards can (1) affect localized or widespread areas, (2) be frequently unpredictable, (3) result in substantial loss of life (in addition to the potential for damage to property), and (4) pose a significant threat to the infrastructure of a given area. But technological hazards differ from natural hazards in some important ways. First, unlike weather phenomena such as rainfall, winds, or tornados, which are apparent to the casual observer, the warnings associated with technological hazards are often complex and may require recognition by trained personnel. Second, while mitigation measures still require intervention before the event to reduce impact (for example, community planning), sometimes corrective measures can and should be taken by trained personnel at the onset of an incident to reduce its effects.

Individuals do not have the resources to prevent or reduce the effects of most technological disasters effectively. But you are not unprotected. Local, State, and Federal governments can provide effective control through regulations and monitoring. New laws have been enacted at each level of government that give the citizen considerable power to influence mitigation actions. These and other tools focus on the role of local control, management, and prevention.

It is up to you to be aware of the potential hazards in your community. The best protection for you and your family is to be aware of the possibilities and to know how to react safely and appropriately in the event of an incident. This unit discusses the kinds of actions that can be taken to protect you from technological hazards.



Corrective measures frequently can and should be taken by trained personnel at the onset of technological hazard incidents to reduce harmful effects.



Hazardous materials are substances or materials which, because of their chemical, physical or biological nature, pose a potential risk to life, health or property if they are released. Potential hazards can occur during any state of production, storage, transportation, use, and disposal.

The storage and use of hazardous materials does not occur only in and around chemical manufacturing plants. Commercial facilities also store and use hazardous materials. For example, local service stations' supply of gasoline and diesel fuel can be hazardous. Hospitals regularly store flammable materials as well as other potentially hazardous substances used in medical treatment. In fact, many hazardous materials are located in your home.

A number of public and private sector initiatives are in place to increase the awareness of the hazardous materials problem. In addition, they provide a higher level of preparedness. Several are of particular significance.

In 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA) of 1986. Title III of this legislation requires that each community establish a Local Emergency Planning Committee (LEPC). The LEPCs are responsible for gathering information about hazardous materials in the community. This information is used to help communities plan their emergency response to hazardous materials incidents. It also provides information for citizens who are concerned about the risk of such incidents. Local facilities that maintain stocks of substances designated as extremely hazardous are required to notify the LEPC, fire department, and the State of the presence, quantities, and location of such materials. These facilities also are required to strategically post this information at their locations.

The National Response Center is a single-call referral system that streamlines the Federal response mechanism by providing a continuously staffed location to receive and refer action for all reports of oil and hazardous materials spills throughout the United States. It can activate a host of resources of the National Response System (NRS) after receiving notification via its 24-hour toll-free 800 number. This service is funded by the U.S. Department of Transportation (DOT) and the Environmental Protection Agency (EPA), and staffed by the U.S. Coast Guard (USCG) and Marine Science technicians, who can render assistance and refer information to appropriate agencies in response to any oil spill, hazardous chemical release, or radiological incident. The toll-free number is (800) 424-8802.

In addition to the large quantities of hazardous materials maintained in communities, hazardous materials are transported daily in this country by air, water, road, rail, and pipeline. Of the 1.5 billion tons of materials transported each year, more than half move by trucks along the nation's highways. The Department of Transportation requires any carrier transporting hazardous materials across a State line to display a clearly visible sign identifying the substance and the type of hazard it could cause. Additionally, DOT restricts the routes and speed limits available for the movement of hazardous materials.

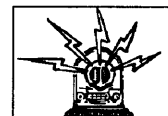
The Chemical Manufacturers' Association (CMA) is also involved in working with the community to reduce chemical risk. CMA has set up a voluntary, industry-wide *Community Awareness and Emergency Response Program* (CAER). The program encourages plant managers to work with the community to ensure safe handling, storage, transportation, and disposal of dangerous chemicals.

Emergency response personnel use hazardous materials information required by SARA Title III as well as information posted on vehicles carrying hazardous materials to assist them in handling hazardous materials incidents.

Another program available for emergency personnel is CHEMTREC, which stands for CHEMical TRANsportation Emergency Center. This is a public service of the Chemical's Manufacturers' Association, located in Washington, D.C. CHEMTREC provides immediate advice for emergency personnel who are at the scene of an accident or spill.

SIGNS AND WARNINGS

When an emergency occurs involving hazardous substances, people in the area will be alerted by police, fire officers, or highway patrol personnel. Warnings and instructions also will be issued through radio and television.



IMMEDIATE DANGERS

- Immediate dangers from hazardous materials include fires, explosion, and the possible contamination of a community's air, land, and water.
- The release of some toxic gases may cause immediate death or disablement if inhaled.
- Contaminated water resources may be unsafe and unusable, depending on the amount of contaminant.
- Some chemicals cause painful and damaging burns to skin if you come in direct contact with them.
- Contamination of air, ground, or water may result in harm to fish, wildlife, livestock, and crops.
- Many dangerous substances have little or no color or odor; other substances that do smell often will quickly disable one's sense of smell. Therefore, signals that alert the human senses are very unreliable and may be unsafe. Assume the worst when acting for your safety or on behalf of others. KEEP A SAFE DISTANCE.
- A number of chemicals are skin-absorbed nerve toxins, which are often odorless and colorless. Frequently a long delay exists between exposure and the onset of symptoms. These symptoms can be agonizing and often are enhanced because the victim stayed in the danger zone while thinking there was no risk, due to the lack of smell or color. Again, assume the worst.



LONG-TERM DANGERS

- The release of hazardous materials into the environment may cause debilitation, disease, or birth defects over a long period of time.
- Loss of livestock and crops may lead to economic hardships within the community and to food shortages in communities supplied by the affected area.



**HAZARDOUS
MATERIALS
(continued)**

- Exactly how the loss of wildlife would affect a particular area is unknown. Certainly the economy of a community that is dependent on its wildlife would suffer.

MITIGATION

- Use data accessible through Title III to identify companies in your community that manufacture or use dangerous chemicals and substances. Learn what the chemicals are, their hazardous properties, and their dangerous effects. Find out if antidotes are available. Ask the manufacturer for a copy of the product's safety sheet.
- Try to avoid building or buying a house near potentially dangerous chemical sites.


PREPAREDNESS

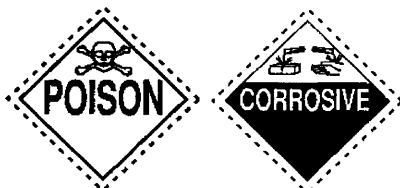
- Know what hazardous substances may be in your community, and by what routes they are transported.
- Keep clearly labeled antidotes on hand for any hazardous substances you store at home. Family members should know when and how to use them.
- Post the number of the nearest poison control center by the telephone.
- Have several evacuation routes planned in case an emergency develops in your community.
- Keep foam-type fire extinguishers in your home and car. Consult your local fire department for recommendations.
- Learn to recognize symbols and identifiers on placards that mark carriers containing hazardous substances.

Know These Warning Symbols and Terms


Placards marked **FLAMMABLE** or **COMBUSTIBLE** indicate that the material will burn. The substance may be ignited by heat, sparks, or flame, and the container may explode.



A placard marked **EXPLOSIVE** means that the substance inside may explode if fire reaches it.



POISON or **CORROSIVE** on any container means that the substance is poisonous if swallowed. If inhaled, the substance may be harmful, and contact may cause burns to skin and eyes or possible poisoning by absorption through the skin. Fire may produce irritating or poisonous gases. Corrosives must be kept in special containers that cannot be corroded or eaten away by the chemical.



An OXIDIZER may ignite wood, paper, oil, or other combustibles. Oxidizers may explode if mixed with fuels, are in the heat of a fire, or undergo friction or shock. Some also can cause burns to skin, eyes, or mucous membranes if touched or inhaled.



An ORGANIC PEROXIDE must be kept refrigerated or it will ignite or explode by itself. Heat from exposure to sparks and flames may cause explosion and intense burning.

Finally, you should inquire about your role in supporting your community's Local Emergency Planning Committee (LEPC). Through the LEPC you may have access to information about chemicals at facilities that are located near your residence, business, or recreation centers.

RESPONSE

- *If you are at or near the scene of a chemical accident...*
 - Do not walk toward the spill or touch any spilled material.
 - Do not inhale gases, fumes, and smoke.
 - Do not assume that gases and vapors are harmless merely because there is no odor.
 - Move away from the accident. Try to stay upstream, uphill, and upwind. You should go at least 10 city blocks (one-half mile) from the danger area; for many incidents. You may need to go further if so advised by emergency response personnel.
 - If the wind is coming from the accident area do not move directly toward or away from the wind. Move so that you feel the wind on the side of your face to avoid the direct path of the fumes.
 - If the wind is blowing toward the accident, walk away from the accident and into the wind.
 - After you are safe, immediately contact emergency services: police, highway patrol, fire department, or emergency medical services. If your community has one telephone number for all emergencies, such as 911, report the nature and location of the accident, and the dispatcher will contact the appropriate service.
 - DO NOT INTERVENE in any way. Lack of training in proper procedures could endanger you and others. Wait for authorities and trained personnel.

If you are at home, work, or school, local officials may ask you to evacuate or to remain indoors and seek in-place protection.

- *If you are asked to evacuate...*
 - Do so immediately; quick and efficient evacuation can greatly reduce or eliminate any danger. Information on where to go, how to get there, and what to take is discussed in Unit Six.
- *If you are instructed by authorities to seek in-place protection...*
 - Close windows and doors, and seal cracks with wet towels, blankets, or tape.
 - Turn off all ventilation, including furnaces, air conditioners, vents, and fans.

**HAZARDOUS
MATERIALS
(continued)**

- Remain in protected areas such as hallways and away from windows until danger has passed. Keep a radio with you to remain updated.

RECOVERY

- Follow local instructions concerning the safety of locally available food and water.
- Clean up and dispose of residue carefully. Follow instructions from emergency officials concerning clean-up methods.
- State and Federal agencies are prepared to assist in the clean-up of chemical spills. Such agencies utilize containment and scrubbing equipment, special neutralizing materials, and other apparatus specifically designed for such emergencies.

If you want to learn more about hazardous materials, take FEMA's home study course *Hazardous Materials: A Citizen's Orientation* (HS-5). The course addresses hazardous materials and human health, regulations governing hazardous materials, identification of hazardous materials, preparation for hazardous materials incidents, and hazardous materials in the home.

A **radiological accident** is an event that involves the release of potentially dangerous radioactive materials into the environment. Radiological accidents can occur *anywhere* that radioactive materials are used, stored, or transported. Hospitals, universities, research laboratories, industries, major highways, railroads, and shipping yards could be sites of a radiological accident. Radioactive materials are dangerous because of the harmful effect of certain types of ionizing radiation on the cells of the body. A radiological accident could allow radiation to contaminate the environment. The degree and area of contamination could vary greatly depending on the type and amount of radioactivity.

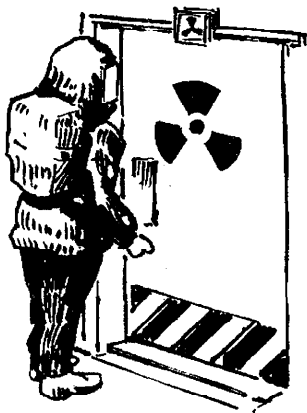
Radioactive materials are composed of atoms that are unstable. An unstable atom gives off its excess energy until it becomes stable. The energy emitted is **radiation**. The process by which an atom changes from an unstable state to a more stable state by emitting radiation is called **radioactive decay**, or **radioactivity**.

Because the atoms that make up radioactive materials slowly decay and stop emitting radiation, radioactive materials eventually lose most of their radioactivity. How long particular materials remain hazardous depends on how long it takes for all the atoms to change to a stable state. This process can last from less than a second to a million years, depending on the type and amount of radioactive material.

Radiation cannot be seen, tasted, smelled, or felt. A radiological accident requires specialized emergency service personnel who have been trained to handle radiation hazards safely and who have specialized equipment to detect and monitor radiation.

On March 28, 1979, the most serious accident ever to occur at a United States commercial nuclear power plant occurred at the Three Mile Island facility near Harrisburg, Pennsylvania. A malfunction that damaged the nuclear reactor core threatened to release radioactive substances into the environment. With assistance from government officials and nuclear scientists, a serious release of radioactive substances was avoided.

As a result of the incident at Three Mile Island, major changes were instituted in the regulation of the nuclear power industry. FEMA was given the responsibility for review and approval of State and local radiological emergency plans and preparedness for jurisdictions located within a 10-mile radius of commercial nuclear power plants—the area known as the **plume emergency planning zone**—and the 50-mile radius known as the **ingestion emergency planning zone**.



Radiological substances are strictly monitored and controlled to avoid hazards from unsafe handling or transportation.



An accident at a nuclear power plant would not cause the widespread destruction of a nuclear weapon. No mushroom cloud would be produced. Although radioactive materials could be released in a cloud or **plume**, which could be carried downwind by air currents, no fallout is produced to endanger people. Emergency services would not be interrupted, and radiation levels would be monitored by

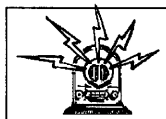
**RADIOLOGICAL
ACCIDENT
(continued)**

government officials to determine the potential danger and to warn the public. In all probability, the persons in most danger of radiation exposure would be the emergency personnel at the plant. Local citizens would be evacuated or instructed about how to avoid radiation hazards.

For commercial nuclear power facilities, the Nuclear Regulatory Commission (NRC) has set up strict guidelines for licensing construction and operation. Inspectors regularly visit all construction sites and remain on-site at commercial power plants that are licensed to operate. The environment surrounding nuclear facilities undergoes constant monitoring for radioactive contamination.

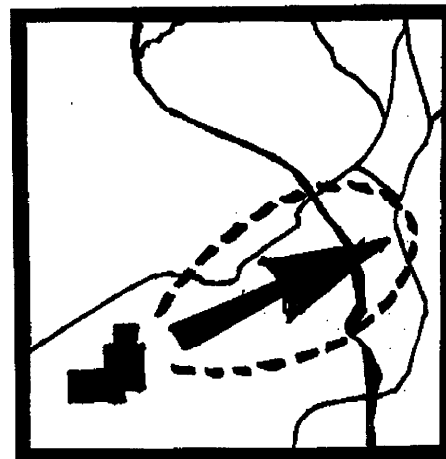
Each State and local community within a 10-mile radius of a nuclear power plant must have an emergency plan for an accident at the plant. The State and local community must participate in an emergency exercise at least every two years and meet specific standards and criteria for preparedness.

The transportation and storage of radioactive materials is strictly regulated by the Department of Transportation (DOT) and the Nuclear Regulatory Commission. Shipping containers with large quantities of radioactive materials must be appropriately and clearly marked. The DOT restricts the speed limits and routes available for the movement of highest quantities of radioactive materials, and vehicles transporting large quantities must bear a radioactive placard. Communities located on major transportation routes should develop and practice an emergency plan for handling transportation accidents involving radiological materials.

**SIGNS AND WARNINGS**

An individual cannot detect radiation by sight, smell, or any other sense. However, you should learn the emergency warning system in your community if you live near a nuclear power plant, a major shipping route, or a facility that stores nuclear materials, wastes, or spent fuels. This radiation symbol marks areas of buildings and containers where radioactive materials are used and stored.

If an accident occurs involving radioactive materials, many emergency services are likely to be involved in the response. If the radiation levels are dangerously high, the area immediately around the accident site may be evacuated. The size of the evacuated area will depend on the type and amount of radiation and on weather factors. Special warning systems such as sirens, tone-alert radios, and/or route alerting have been established around nuclear power plants to alert the public during time of emergency.



Markings on this map denote the area downwind of a nuclear power plant that might be evacuated in the event of an incident. The size of the evacuated area is determined by the weather and by the type and amount of radiation released.

IMMEDIATE DANGERS



Radioactive materials emit different types of radiation, each of which presents its own danger to the human body. Some types of radiation can penetrate the skin and travel through the body. If the level of radiation is high, these types are dangerous just from being close to them. This danger is called an *external radiation hazard*. Other types of radiation are more dangerous when the radioactive materials are taken inside the body by inhaling contaminated air, getting the radioactive material in open wounds, or eating or drinking radioactive substances. This danger is called an *internal radiation hazard*.

All radiological accidents will not necessarily result in radiation exposures that can cause severe health effects and possible death. Due to packaging requirements and other regulations, an accident involving the transport of radioactive material may not even result in a release of the material into the environment. The potential health effects resulting from a radiological accident will depend on the type and quantity of radioactive material released and the amount of exposure received. An accident involving the shipment of small quantities of radiopharmaceuticals to hospitals would be far less severe than an accident involving the release of a significant quantity of radioactive materials from a commercial nuclear power facility.

- The immediate danger from radiological accidents is from exposure to radiation, either internally or externally. The level of radiation that is harmful depends on the total amount of exposure. Radiation effects are cumulative. The greater your total exposure, the higher the risk of serious damage to your body.
- The danger from external radiation varies depending on the type of radiation, the length of the exposure, the distance you are from the source of the radiation, and the amount of shielding between you and the source. Your body weight and general state of health also are factors to be considered.
- Radiation exposure causes damage to the cells of the body. Any exposure to radiation is likely to cause some cell damage. Your body can recover from a limited exposure to a small amount of radiation. The more you are exposed to radiation, the greater the cell damage and the more likely you are to become ill.
- Radiation sickness can result from a *single exposure* to a large amount of radiation or from *repeated exposure* to small amounts. The more exposure and the more cell damage, the greater the effect on your body. If many cells are damaged, you are likely to experience more severe symptoms such as nausea, vomiting, and diarrhea. Radiation exposure can also impair the production of white blood cells and weaken the body's ability to fight infection. Therefore, a high degree of total radiation exposure makes your body susceptible to infection. The combined effect of high cell damage and lowered resistance causes severe radiation sickness and possible death. In cases of very high exposure, death is probable.
- If radioactive substances are taken internally, the damaging rays continue to be emitted while natural *radioactive decay* occurs. The natural process of the body may get rid of some of the radioactive substances, but others may be retained.
- Radiation sickness is not contagious. You cannot *catch* radiation sickness from someone who has been exposed to radiation. The illness is a result of cell damage and the weakening of the body's defenses. No drugs can *cure* radiation sickness. Medical care and antibiotics can reduce the danger from infection while the body repairs itself.

**RADIOLOGICAL
ACCIDENT
(continued)**

- The chances of recovery depend on the amount of damage and the general state of health at the time of exposure. Children, pregnant women, and persons in poor health are likely to experience greater damage from smaller total amounts of radiation than adults in good health.
- The only way to avoid radiation sickness is to avoid exposure to external hazards, avoid breathing radioactive dust particles in the air, and avoid consuming contaminated water or food. If you cannot avoid the exposure, at least limit the exposure as much as possible. Seek medical help if you know that you have been exposed or that you have consumed contaminated food or water.

**LONG-TERM DANGERS**

Although the effects of radiation many months or years after exposure are not clearly known, but they are thought to include leukemia, cancer, cataracts, sterility, birth defects, and genetic disorders. While radiation itself may not be the cause of these effects, scientists believe that a link exists between exposure to dangerous levels of radiation and the chances of suffering some of these effects later.

MITIGATION

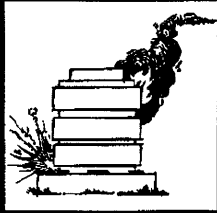
- Know the locations of nuclear power plants, radioactive storage sites, radioactive waste dumps, and facilities that use radioactive materials in or near your community.
- If you live near a nuclear power plant, attend public information meetings to learn about radioactivity, safety precautions, and mitigation measures being taken by the utility company, the local community, and the State.

**PREPAREDNESS**

- Public information materials are available from all nuclear power plants to tell you what actions to take in the event of an emergency at the plant. If you live within 10 miles of such a facility and have not received these materials in the mail, call the operating company or the local emergency management office and ask for a copy. You should read and retain these materials and refer to them in time of emergency.
- Know which emergency broadcast radio or television stations (and station frequency or channel number) will be used to announce warnings and emergency instructions.
- Keep an emergency supply of food, water, and any special medicines required by you and your family members. (Unit 6 will provide specific information on supplies you would be likely to need.)
- Have several evacuation routes planned. Your routes should be consistent with those planned by emergency management officials. Know what to take, how to locate family members at any time of the day or night, and how to close your house so that you can leave promptly.

RESPONSE

- If a radiological accident occurs in your community, remain calm. Listen to local radio or television for announcements. If you or your home is in any danger, local emergency officials will advise you by radio or television of the actions you should take.
- If you are told to evacuate, do so immediately. Follow the officially recommended route, even if it is crowded. You will be sent in a direction that will not put you in danger of the radioactive plume carried by the wind.
- If you are told to take shelter in your home or office, stay there. Close doors and windows. Turn off fans. Do not run air conditioners unless emergency officials tell you it is safe to do so. Stay in your basement or in a central part of your house. Listen to your local radio or television station for emergency information. Do not go outside until an *all clear* announcement is made.
- There are three ways to minimize radiation exposure to your body: shielding, distance, and time.
 - *Shielding* Heavy, dense material between you and the source of the radiation can serve as protection.
 - *Distance* The more distance between you and the source of radiation, the less radiation you will receive.
 - *Time* Limiting the time spent near the source of radiation reduces the amount of radiation you will receive.
- When the immediate danger has passed, avoid using foods from your garden or milk from your cows or goats until these can be inspected by a local emergency official. Contamination can affect areas many miles from the accident site.



Technological
Hazard:
**STRUCTURAL FIRE
AND EXPLOSION**

A **structural fire** is a fire in a house or building from natural, human, or technical causes. An **explosion** is a rapid and powerful combustion.

The threat of fire and explosion exists in every building. Fire and explosion can be caused by accidents, by electrical wiring, or by careless use of fire. They can also be caused intentionally, as in the case of arson or terrorism. Although arson once was confined to major urban areas, it now occurs in communities all over the United States. Fires are most devastating when they occur in large skyscrapers where hundreds of people work or live. Even in buildings that are structurally resistant to fire, lives can be lost from inhaling smoke.

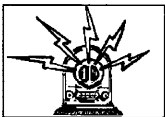
Late in 1980, the MGM Grand Hotel in Las Vegas, Nevada, experienced a devastating fire. Improper ventilation of elevator shafts caused smoke to spread quickly to upper floors. More than 80 people were killed and hundreds more were injured. Many people staying at the hotel had to be evacuated by helicopter. Property damage was in the millions.

Accidental explosions have caused deaths, injuries, and major damage to large grain storage bins when gases given off by high concentrations of grain have exploded. Explosives have been deliberately planted for purposes of extortion or terrorism in public buildings, casinos, and airport terminals.

Approximately three-quarters of all fire fatalities occur in residential dwellings. The greatest number of fires, fire-related deaths, and injuries occur in the nation's homes.

One striking aspect of the nation's fire problem is the indifference with which citizens confront it. Destructive fires take a huge toll in lives, injuries, and property losses, yet there is no need to accept those losses with resignation. There are many measures—often very simple precautions—that can be taken to reduce them significantly.

For example, fire drills and prominent exit signs are mandatory fire safety measures in all public buildings. Other measures that communities can take to reduce losses from fire include establishing fire codes for all public and private buildings, with inspections made regularly by local and State officials to ensure compliance. Adopting smoking laws in high-risk areas can eliminate the fire hazard of careless smoking. Fire departments can also develop mutual aid agreements with other jurisdictions to ensure adequate assistance in the event of a major fire.



SIGNS AND WARNINGS

Fire alarms are installed in public buildings. Other warning devices, such as smoke detectors, can alert families to fire in their homes. Intense heat, flames, and smoke are recognizable signs of fire in a structure. Explosions usually are accompanied by a loud bang, blast waves, and flying debris.



IMMEDIATE DANGERS

Heat and smoke present the most immediate danger from structural fires. The force

of an explosion may cause injury or unconsciousness. In crowded public buildings, panicked behavior may present the greatest danger.

LONG-TERM DANGERS

The spread of fire to other buildings or to fuel supplies could cause their destruction and long-term economic effects.



MITIGATION

- Teach family members the proper way to handle fire. Fire safety information is available from local officials, the State Fire Marshal's Office, the U.S. Fire Administration, and the American Red Cross.
- Follow fire and life safety building codes when building a home. Avoid the use of materials that have proven particularly vulnerable to fire or could foster its spread to other houses—such as many types of wooden shingles and shakes. In older homes, have wiring and fireplaces inspected by a fire safety inspector. In a home of any age, chimneys must be cleaned regularly to avoid the possibility of a chimney



fire that could spread to the roof and other parts of the house. Be sure that wood stoves are properly installed. Incorrect installation, often by homeowners, is a common cause of fires in some areas.

- Do not store combustible materials in closed areas or near a heat source.
- Do not overload electrical circuits.
- Replace frayed electrical cords.
- Buy fire insurance for your home and/or business.

Once smoke detectors have been installed, they should be tested on a regular basis. Batteries should be replaced at least once a year, or as specified by the product's instructions.

PREPAREDNESS

- Plan alternate escape routes from all levels of your house. Review the plan with



**STRUCTURAL FIRE
AND EXPLOSION
(continued)**

all family members.

- Hold periodic fire drills.
- Install metal or rope ladders as fire escapes from the upper floors of your house.
- Install smoke detectors and test them every month. If you own a business, install fire alarms and sprinkler systems. Replace the batteries at least once each year, or as indicated in the instructions. Smoke detectors, alarms, and automatic sprinklers are preventive measures designed to discover and suppress fires before they spread.
- Equip your home with residential fire sprinkler systems to assure a safer environment for your family and protection of your investment and irreplaceable family possessions.
- Post the number for the fire department and emergency medical service by the telephone. Teach all family members how to report a fire emergency.
- Teach family members what to do in various fire conditions such as heavy smoke or blocked exits.
- Keep fire extinguishers in your home and car. Learn how to use them, and teach family members. Ensure that these are inspected regularly. Read the instructions on the extinguisher for inspection details.
- Learn how to treat burns; contact your local Red Cross for available first aid courses.

RESPONSE

- If you see a fire, immediately report it to the local fire department. Give clear and exact information concerning the fire's location.
- If a fire alarm sounds in a public building, leave immediately. Remain calm. Do not run. Use fire exits or stairs. Do not use elevators.
- If possible, contain the fire. Use the correct firefighting method. If there is an electrical fire, do not use water unless the electricity is turned off. If a flammable liquid is burning, smother it; do not splatter it.
- Stay low in a burning building. Heat and smoke will rise. Hot air can scorch your lungs and smoke may contain toxic fumes. Take short breaths and, if possible, cover your face with a damp cloth and breathe through your nose.
- Be sure of your escape route. Do not let the fire get between you and a way out.
- Check doors before opening them. If a door is hot, do not open it. Open a door carefully if it is cool, keeping your head to one side to avoid any blast of hot air.
- If your clothing catches fire, drop and roll.

- Once you and your family safely escape a fire, do not go back inside a building for *any* reason.

RECOVERY

- Have the damage to your home assessed by your insurance company. File a claim as soon as possible.
- You may need to find temporary housing, food, clothing, and other assistance. Your insurance company may help to pay for the expense, or you can contact your local chapter of the American Red Cross or the Salvation Army.

HOW WELL HAVE YOU LEARNED?**Unit Four Review**

(Answers on page A-2)

Answer each of the following questions by placing a check next to the *best* response.

1. If you are at or near the scene of a chemical accident, what is the correct action to take?
 - ☐ a. Attempt to identify the material.
 - ☐ b. Move a safe distance from the accident and summon emergency assistance.
 - ☐ c. Remain at the scene to assist authorities.
 - ☐ d. Contact emergency services from the scene.
2. You live a few miles from a nuclear power plant. If you hear sirens, what should you do first?
 - ☐ a. Evacuate immediately.
 - ☐ b. Listen to local radio reports and prepare to evacuate if necessary.
 - ☐ c. Close your doors and windows and take shelter in your basement.
 - ☐ d. Do nothing because you probably live outside the endangered area.
3. If you are caught in a burning building, what is the correct action to take?
 - ☐ a. Stay low—heat and smoke will rise.
 - ☐ b. Open all doors immediately.
 - ☐ c. Extinguish any electrical fires with water.
 - ☐ d. Once you and your family are safe, go back inside to save valuables.
4. If you are caught outside during a hazardous materials accident, you should immediately
 - ☐ a. Try to identify the hazardous material.
 - ☐ b. Move to an area upstream, uphill, and upwind.
 - ☐ c. Begin cleanup efforts.
 - ☐ d. Secure the area.
5. Which of the following should NOT be done when seeking in-place protection following a hazardous materials release?
 - ☐ a. Seal doors and windows as tightly as possible.
 - ☐ b. Turn off all ventilation.
 - ☐ c. Open a window to get a better view of what is happening.
 - ☐ d. Keep a radio nearby to remain updated.